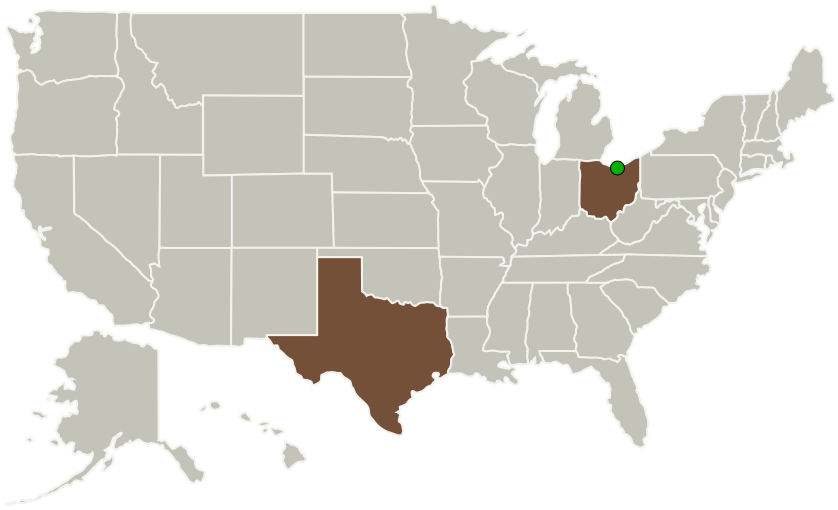
Carbon-Carbon High Melt Coating for Nozzle Extensions, Phase II

Completed Technology Project (2011 - 2013)

Project Introduction

The High Melt Coating system is applied to a carbon-carbon structure and embeds HfC, ZrB2 in the outer layers. ACC High Melt builds on the time tested base material system of T-300 fibers, impregnated with phenolic resin, pyrolyzed, densified, and SiC Conversion coated For Phase 2, C-CAT proposes to team with Pratt and Whitney Rocketdyne to fully develop High Melt into a material system that when combined with the appropriate design will produce nozzle extensions for future NASA spacecraft. PWR will supply the designs for a notional nozzle extension for a 2000 lbf LOX/LCH4 lunar descent engine and a nozzle extension for a notional lunar ascent engine sized at 5500 lbf LOX/LCH4. Objectives: C-CAT engineering will work with PWR designers to insure that the nozzle extension design for each prototype is both manufacturable and will meet the technical requirements. C-CAT engineering will design and C-CAT will fabricate lay-up tools that will take into account ply shrinkage distortion and still maintain dimensional tolerances during processing. Lay-up the nozzle extensions without defects Process each nozzle extension through pyrolysis, heat treatment and coating without defects. Apply SiC Conversion Coating to the ACC High Melt material without spalling.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Carbon-Carbon Advanced Technologies, Inc.	Lead Organization	Industry	Kennedale, Texas
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Texas

Project Transitions

July 2011: Project Start

July 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138858)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Carbon-Carbon Advanced Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

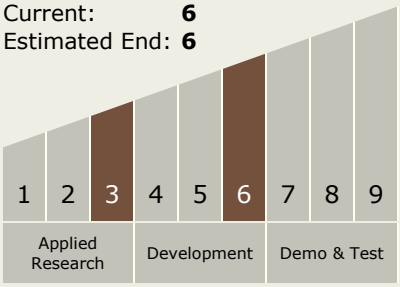
Carlos Torrez

Principal Investigator:

James Thompson

Technology Maturity (TRL)

Start: **3**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System